

**CD-1, Approve Alternative Selection and Cost Range  
for the  
Center for Functional Nanomaterials (CFN)  
A Nanoscale Science Research Center  
at Brookhaven National Laboratory**

**Office of Basic Energy Sciences  
Office of Science**

**A. Purpose**

The purpose of this paper is to document the review by the Office of Science Energy Systems Acquisition Advisory Board-equivalent for the Critical Decision "Approve Alternative Selection and Cost Range (CD-1)" for the Center for Functional Nanomaterials (CFN), a Nanoscale Science Research Center (NSRC) at Brookhaven National Laboratory (BNL).

**B. Mission Need**

The Center for Functional Nanomaterials (CFN) will serve as the nucleus of an integrated BNL program in nanoscience. It will facilitate major new directions in BNL's materials and chemical research programs, and greatly expand the capabilities available to a national user base, thereby increasing our university and industrial interactions. It will enable us to focus the efforts of organizations within BNL by promoting complementary, interdisciplinary work, including the Chemistry Department, the Materials Science Department, Condensed Matter Physics, the Instrumentation Division, the National Synchrotron Light Source Department, and the Biology Department. The Center will also integrate BNL's unique capabilities in a broad range of synchrotron techniques, including hard and soft x-ray scattering and spectroscopy, with new materials synthesis and nanofabrication capabilities at BNL. The Center will serve as a focal point for collaborations, enabling studies of functional materials at the nanoscale involving academia and private industry, particularly in the Northeast, thereby catalyzing a new approach to materials research at BNL.

The scientific goal of the CFN is to understand the chemical and physical response of nanomaterials, with the challenge being to attain the level of understanding needed to tailor or design new classes of functional materials. The CFN's programs will exploit the unique electronic and optical properties of nanoparticles and molecular nanoarrays to design chemical systems with specific functionality for diverse, energy-related applications such as catalysis, photo-induced energy conversion and storage, and molecular conductors. Another science emphasis will be to examine the behavior and fundamental properties of functional nanocomposite materials including ferro-electrics, and magnetic and superconducting thin films to provide insights into their future applications. This capability and focus are complementary to the other planned NSRCs; it capitalizes on the NSLS leadership in new materials probes; and it builds on the strengths of BNL's BES programs in (1) strongly correlated electron systems, (2) catalysis, (3) molecular materials, (4) electrochemistry, and (5) nanostructure in complex functional materials.

### C. Project Preliminary Scope Baseline

The scope baseline consists of the CFN building, and procurement and installation of an initial set of specialized scientific equipment needed to support research activities. The physical structure of the Center will be a new building of about 85,000 gross square feet (gsf) located contiguous to the existing NSLS and the BNL Instrumentation Division buildings. The CFN structure will be a two-story building housing state-of-the-art clean rooms; wet and dry laboratories for sample preparation, fabrication, and analysis; office space for BNL staff and users; and library and conference rooms. Elimination of space to offset this new construction will be accomplished by SC-funded demolition of excess facilities at BNL scheduled for FY 2002 through 2006.

### D. Project Preliminary Cost and Schedule Baseline

The preliminary Total Estimated Cost (TEC) of \$79.7 million and preliminary Total Project Cost of \$81 million are based on receiving the following funding levels (in thousands of dollars):

Fiscal Year	Total Estimated Cost		Other Project Costs	TPC
	Project Engineering & Design	Construction	Conceptual Design, NEPA, Hazard Analysis, Other, and Pre-Operations	Total
Prior			300	300
2003	988			988
2004	3,000			3,000
2005	2,012	20,000		22,012
2006		35,000		35,000
2007		18,700	500	19,200
2008			500	500
Total	6,000	73,700		
	79,700		1,300	81,000

The preliminary schedule baseline is as follows:

CD-0	Approve Mission Need	June 2002
CD-1	Approve Alternative Selection and Cost Range	June 2003
CD-2	Approve Performance Baseline	February 2004
CD-3	Approve Start of Construction	December 2004
CD-4a	Approve Start of Initial Operations	April 2007
CD-4b	Approve Start of Full Operations	April 2008

## **E. Acquisition Strategy**

BNL will hire an Architectural/Engineering (A/E) firm to provide Title I and II engineering design, Title III construction inspection and shop drawing review for the project. BNL will furnish A/E support, including design reviews and approve the final Title I and Title II engineering documents, and will also provide project management, procurement support and construction support services and utility tie-ins. Construction will be performed by a fixed-price, construction contractor administered by BNL. The contractor will be selected using a best value process. Procurement of research equipment will be performed by BNL. The equipment will be competitively procured through fixed price contracts.

## **F. Environmental Strategy**

The CFN will be designed, constructed and operated in compliance with all requirements of the National Environmental Policy Act (NEPA) and its implementing regulations and in accordance with applicable Federal, state and local guidelines for environmental projects. An Environmental Evaluation Notification Form was prepared and has resulted in a Categorical Exclusion (CX) under NEPA.

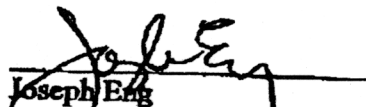
## **G. Preliminary Hazard Analysis**

A Preliminary Hazard Analysis Report for the CFN has been completed and issued in April, 2003. This included an initial hazard screening for the facility to identify potential hazards associated with the construction and operation of the proposed CFN. The initial Facility Hazard Categorization (FHC) of the CFN has been determined to be a "Radiological Facility". Further analysis of radiation generating devices and the chemical inventory will be conducted as the design progresses and processes become more defined, this further analysis may change the initial FHC. The CFN Work Control Process will be used to evaluate and develop controls for the research activities.

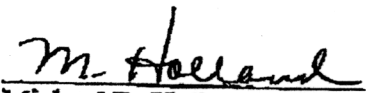
## **H. Energy Conservation and Sustainable Design**

The CFN will be designed to comply with 10CFR435. The project will prepare a compliance analysis report. Sustainable building design principles will be applied to the design and construction of the CFN. Standard practices include using recycled content products, purchasing energy efficient and water efficient material and equipment (Energy Star) and substituting less hazardous construction materials will be used. The project design objective will be to achieve the highest Leadership in Energy and Environmental Design (LEED) rating possible consistent with mission functional requirements and the established project budget.

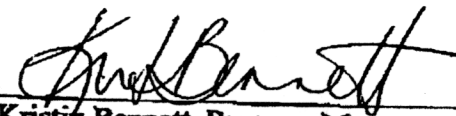
Submitted by:

  
Joseph Eng  
DOE Federal Project Director  
DOE Brookhaven Area Office

June 12, 2003  
Date

  
Michael D. Holland, Manager  
DOE Brookhaven Area Office

6/17/03  
Date

  
Kristin Bennett, Program Manager  
Office of Basic Energy Sciences  
Office of Science

6/28/03  
Date

## Recommendations

The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of CD-1, Approval of Alternative Selection and Cost Range, for the Center for Functional Nanomaterials at BNL as noted below.

James A. Carney 6-12-03 Yes ☒ No ☐  
ESAAB Secretariat, Construction Mgmt Support Division Date

David Bordman 6/12/03 Yes ☒ No ☐  
Representative, Non-Proponent SC Program Office Date

MA Dubi 6-12-03 Yes ☒ No ☐  
Representative, Financial Mgmt. Division Date

Norm B. Loh 6-12-03 Yes ☒ No ☐  
Representative, Environmental, Safety and Health Division Date

\_\_\_\_\_  
Representative, Security Mgmt. Team Date

Paul Wier 6/12/03 Yes ☒ No ☐  
Representative, Laboratory Infrastructure Division Date

\_\_\_\_\_  
Representative, Grants and Contracts Division Date

## Approval

Based on the material presented above and at this review, Critical Decision-1, Approve Alternative Selection and Cost Range, is approved. Therefore, the Brookhaven Area Office is authorized to proceed with expenditure of Project Engineering & Design funds for the design of the Center for Functional Nanomaterials, a Nanoscale Science Research Center.

Patricia M. Dehmer  
Patricia M. Dehmer, Director  
Office of Basic Energy Sciences  
Office of Science

4/23/2003  
Date